TEMPERATURE GRADIENTS IN TARGETS WITH HIGH-INTENSITY IMPLANTATION AND THEIR INFLUENCE ON THE CHARACTERISTICS OF ION-MODIFIED LAYERS*

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This paper is devoted to the study of the gradient temperature field dynamics and distribution in the metal targets irradiated with high-intensity beams of gas and metal ions. The investigations concerned ion implantation modes with the ion beam current density from several tens of mA/cm^2 up to A/cm^2 were investigated.

The ion beam power was additionally varied due to the change of ion energy in the range from 0.6 to several keV and the pulse duty factor in the range of 0.2–0.8. The integral temperature of the target was measured with an electrically isolated thermocouple. To measure the dynamic change in the local temperature on the irradiated target a high-temperature pulse pyrometer KLEIBER 740-LO was used.

The problem of temperature evolution and metal sample melting under the exposure of a high-intensity repetitively pulsed ion beam was solved numerically using the heat conduction equation written in cylindrical coordinates.

Analysis of the experimental data obtained with the use of electrically isolated thermocouple, pulse pyrometer, and numerical simulation revealed the presence of significant gradient temperature fields both over the surface and along the depth of targets irradiated by high-intensity ion beams.

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